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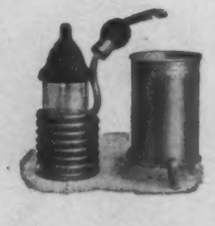

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OCEAN SHORE RAILWAY CONSTRUCTION

By B. B. Beckett.

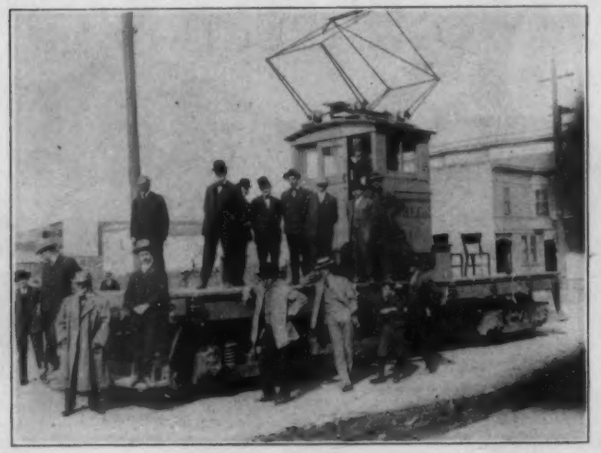
The Ocean Shore Railway when completed will be a double track electric road, the main line extending from San Francisco to Santa Cruz, California, a distance of eighty-two and one-half miles, and running in full view of the ocean for nearly the whole distance. All along this little-known coast line the scenery is magnificent. Precipitous cliffs and rocky points jutting out into the ocean alternate with secluded valleys and white stretches of sandy beach. The road is already in operation some fifteen miles up from Santa Cruz. The grade is practically completed down from San Francisco to Half Moon Bay, with the exception of the tunnel which is being driven under San Pedro Point, and a single track is practically completed into San Pedro Valley. The tunnel, which is the only one on the Ocean Shore lines, is 340 feet long and constructed for a double track.

On June 25th the first electric car was run on the Ocean Shore. This was a motor flat car with the motorman's cab in the center and was built for construction work and as a locomotive for hauling freight cars. The trial trip was made over what is known as the Market street branch of the Ocean Shore lines, running along Twelfth street and out Potrero avenue to the main line south of Army street, a distance of

LOOKING NORTH FROM GREEN CANYON —LINE OF OCEAN SHORE RAILWAY

two and one-half miles. This branch has already been equipped electrically and the work of equipping the main line as far down as Ocean View is in progress. From this point down the road will be operated by means of steam locomotives temporarily until the contemplated 6000 Kw. power house at Balboa can be erected.

Power for the present electrification is secured from the lines of the San Francisco Gas and Electric Company, near Army and Vermont streets, at 13,200 volts, 25 cycles. It is converted into direct current at 600 volts by means of the



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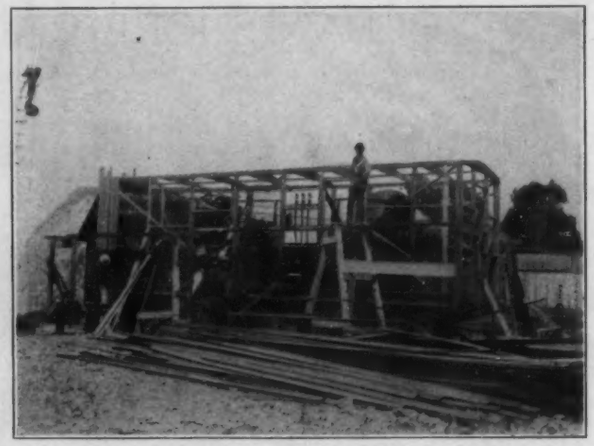

PORTABLE SUB-STATION IN CONSTRUCTION

usual rotary converter sub-station, but this particular sub-station is a portable one. As a reserve in case of break-down, it was originally planned to build such a portable sub-station, which could be run in to the assistance of any other sub-station that might be in trouble. Later when the temporary arrangement for supplying the Twelfth-street branch was determined on, it was decided to build the portable sub-station first and use it for this purpose.

The machinery is exactly the same as that ordered for the ten fixed sub-stations to be built later, and though heavier than would ordinarily be used on a portable, it has the great advantage of uniformity, making it unnecessary to carry a special lot of repair parts. The installation consists of a group of three 185 Kw. transformers and a 500 Kw. rotary converter with necessary starting and switching apparatus. This machinery was set up on a standard flat car, which was afterward boxed in, so that in outside appearance, it resembles an ordinary box car. Entering at one end of the car, the three 13,200-volt leads pass through automatic oil switches controlled by an instantaneous overload relay; thence to the 185 Kw. transformers, which are connected in delta on the high-tension side. The secondary leads are all carried separately down under the floor and over to the six-phase rotary in the other end of the car. The machine is started as an induction motor, the stationary field poles acting as the secondary. There are two intermediate taps to each transformer giving one-third and two-thirds full voltage, which is applied in three successive steps. On the first step, the machine speeds up almost to synchronism, and on the second, locks in step. In order to prevent excessive potential in the field during the operation of starting, the field circuit is broken up into three sections. It may be closed as soon as full voltage is on the machine, but if the latter has picked up with reversed polarity, the field must be reversed for a moment. The whole operation requires from a minute to a minute and a half. For the purpose of raising the voltage by over-compounding, resistance coils are put in series with the machine, and by this means it is possible to get about 575 volts D. C., although the A. C. voltage is received about twenty per cent below normal. In order to save weight, the slate panels and all unnecessary switching apparatus were omitted from this installation.

The motor flat car above mentioned is equipped with four G. E.-73 (75 H. P. each) motors, multiple unit control and both straight and automatic air. It has a free running speed of twenty miles an hour and will be able to haul a train of two hundred tons over the grades and curves that will be encountered. The worst condition on the Twelfth-street branch is a sixteen-degree curve on a 3.5 per cent grade.

The pantograph trolley with the sliding contact has been adopted for the Ocean Shore. This trolley was introduced for high tension A. C. work and has never before been used on D. C. roads. It is somewhat experimental therefore, but tests have shown its practicability. It cannot fly off the wire and does not have to be reversed. The latter feature is a decided advantage for a switching locomotive.

The Ocean Shore has adopted the catenary form of trolley wire suspension, which was also introduced for high tension A. C. work. The 0000 grooved trolley wire is supported at intervals of about fifteen feet, from a special high-grade steel ⅜-in. messenger cable, having a breaking strength of eight thousand pounds. The spans on tangents are 150 feet, but since a sag of twenty-seven inches is allowed in the messenger cable, the tension is only one thousand three hundred and twenty-five pounds.

Sidney Sprout is the electrical and mechanical engineer for the Ocean Shore; W. G. Vincent Jr. and B. B. Beckett are his assistants.

CONVENTION OF PACIFIC COAST GAS ASSOCIATION.

The 15th Annual Convention of the Pacific Coast Gas Association will be held at Santa Cruz on September 17th, 18th and 19th, 1907, at which Mr. Jno. Martin will preside.

REPORT ON THE SAN FRANCISCO FIRE.

The combined reports of the condition of the buildings of San Francisco, following the earthquake and fire of April 18, 1906, submitted to the United States Geological Survey by Professor Frank Soule, Dean of the College of Civil Engineering in the University of California, Captain John Stephen Sewell, Engineer Corps, U. S. A., and Richard L. Humphrey, expert in charge of the Structural Materials Division of the Technologic Branch of the Geological Survey, and Secretary of the National Advisory Board on Fuels and Structural Materials, reach the conclusions that the lessons from the Chicago and Baltimore fires have not yet been learned, and that a great conflagration with its attendant loss of life and millions of dollars in property is possible in every big city of the country.

Professor Frank Soule, concludes as follows: "The failure of fireproofing methods in San Francisco is directly traceable to the commands of the owners to their architects to cheapen, as far as practicable, the fireproofing and the construction generally, in order to secure greater interest on their investments. This cheapening has often occurred, in spite of the protests of the designer and it is in an entirely wrong direction; for rates of insurance are largely reduced with improvements in fireproofing; and as the cost of the steel frame and its proper fireproofing seldom exceeds 27 per cent of the cost of the building, it seems wise to protect the other 73 per cent with adequate materials.

"In some instances in San Francisco, brick laid in rich Portland cement mortar has been found to be an excellent fireproof covering. Good brick has withstood well the severe fire, and when laid in good cement, has afforded a strong fireproof wall or pier. At least four inches in brick was found necessary, and a layer of concrete three inches in thickness between that and the steel was a great improvement and served well to protect the latter from rust. But this method will probably not be followed in general, on account of weight, bulk and expense. Hollow brick and tiling was efficient, also, when properly and liberally used, as well as correctly applied on a good system. It has fireproofed satisfactorily; porous tiles proving to be the better.

"In a country subject to earthquakes, a strongly-framed and well-founded wooden house, two, or, at most, three stories in height, with non-disintegrating plaster and finish, light tile chimneys and ample fire prevention and protection is the ideal type of residence structure.

"The high steel frame office buildings have shown that in order to resist perfectly the bending moments and shears induced by the swaying due to earthquake movement, such buildings should be stiffened in their joints and connections by the best riveting combinations and knee and other bracing, particularly at or near the ground floor.

"Columns, exterior and interior, should be put in more liberally in future, upon the first and second stories, and the strongest joints and connections should be adopted in order to resist the bending and shearing. With such strengthening the high steel structures will safely endure an earthquake of even greater severity than that of April 18, 1906. This kind of building has proved its worth and reliability and has 'come to stay.' It has been tried and has not been found wanting Minor improvements, as advocated, will produce a perfect structure.

"Concrete and reinforced concrete have become popular for construction with a large number of designers in San Francisco, on account of the claimed strength, indestructibility, facility of use, and fire and rust protection their materials afford. Unfortunately for San Francisco, there were few structures of concrete or reinforced concrete in the city at the time of her great trial; but these few behaved well, during both the earthquake and the resulting fire.

"Therefore, although such structures are admittedly new and comparatively experimental on the Pacific Coast, the confidence reposed in them has already led to the designing of a number of large buildings of this type for public or business purposes.

"At present the sentiment is to limit them to a height of six or eight stories, on account of their experimental character and because of the fear that greater height would permit a reversal of stress, due to 'quake and wind force in the reinforced girders.

"Mill construction with brick will undoubtedly be utilized in many instances for a considerable time to come, but the lesson taught us should be learned, that the materials used should be first-class pressed-brick, well-wetted, and cement mortar, and that all parts should be thoroughly tied and anchored together. This rule has been found by our experience to be a most important one to follow, in all brick and stone construction, and its neglect in the past resulted in much loss and ruin.

"The damage inflicted upon San Francisco from the direct and immediate effect of the earthquake was relatively small, being estimated at from three to ten per cent. only of the total loss; but the subsequent and indirect effect was to paralyze the water supply and its distributing system, start a great conflagration, render impossible its extinguishment with the means at hand, cause the death of at least 500 human beings, burn approximately $500,000,000 worth of property, render houseless, homeless and miserable 200,000 people, and inflict remoter damages to business, commerce and labor, only to be estimated in the future. When we can see plainly, as we may, looking backward, that nearly all of this destruction and suffering might have been prevented by wise foresight and provision, we feel that we must send a warning to all the cities of the world. Any city that disregards this warning will be guilty of a great crime.

"Of a building's entire fire damage, the risk from fire within the building is estimated, on the average, at forty per cent, the other sixty per cent of the risk being from the exterior of the building. This risk for interior fires should be reduced to a minimum by ample provision for fire prevention. As far as practicable, the absence of combustible material should be secured.

"While the danger from exterior fires to a given building is ordinarily estimated at sixty per cent, it practically becomes one hundred per cent in case of a great conflagration. In San Francisco, little protection from exterior fires has been adopted. Many of the best buildings, had they been furnished with metallic shutters of the best design, with wire-glass in metal sashes, and with cornice and other exterior sprinklers, supplied by a private water plant, certainly might have been saved.

"Concrete floors with metallic mesh reinforcement are strongly recommended for strength and fireproof character.

"A non-inflammable substitute for wood work and trim generally is greatly to be desired.

"Steel columns may be well fireproofed by surrounding them with four inches thickness of the best quality of stone or cinder concrete, or by three inches thickness of either, when hollow tiling is put upon the exterior.

"Three-inch porous terra-cotta tiling, wrapped on the outside with wire, and metal mesh used around the bed course of the column, has proved efficient. The mortar of the tiles should contain a large percentage of cement, and they should be strongly anchored to the columns, to prevent their falling away in earthquake or fire and so leaving the steel exposed.

"Structures made of concrete blocks were usually greatly damaged or even ruined by the earthquake, owing to imperfect anchorage and failure to cohere to their joints.

"Granite, sandstone and marble were badly cracked and spalled by the fire, the latter stone often crumbling to powder.

Final Conclusions.

"A proper foundation, stable and firm, is of vital importance, and particularly in the case of soft, marshy or made

ground. Anchorage, bounding and tying of all masonry, should be strongly practiced. Steel framing should be made heavier rather than lighter, and joints, connections, bracing and floorings, should be strongly united. Girders and columns should be made very stiff, and, where practicable, continuous. Fireproofing should be of the most perfect type, and no reasonable expense should be spared in its installation.

"The lessons taught by the great fires of Boston, Chicago and Baltimore, have been verified in San Francisco's experience. In addition to these lessons, the following conclusions may be drawn: (a) Roofs, roof appurtenances and skylights should be given ample protection against fires from without. (b) A great excess of fire hose and apparatus beyond ordinary needs, should be available. (c) A strong bond for fireproofing, tiling, etc., both for girder and column protection, is essential. (d) Protection for front windows, as well as for side and rear ones, is of vital importance. (e) Good protection for steel frames and steel roof trusses in attics or the exposed or unusual places, should be provided. (f) Liberal use should be made of fire retardent in windows and door transoms. (g) Wise and liberal use of concrete and reinforced concrete for girder and column fireproofing has proved its savings quality. (h) Interior fire protection and prevention by wells, pumps, sprinklers and water tanks vastly lessen fire-risk."

"In my judgment," continues Captain Sewell, "to secure the best results, the steel construction should also be inclosed with walls of reinforced concrete. The proper artistic treatment of this material would seem to be a very important problem for the architects in a place like San Francisco. Its great utility in earthquake shocks cannot be denied. Where steel frame buildings are to be finished with ordinary masonry walls, however, complete bonding of all face bricks with full header courses should be absolutely required; no other form of bond is adequate. Nothing but Portland cement mortar should be allowed in any portion of the structure. The masonry should be tied to the steel frame in the very best possible way, and much more securely than is ordinarily the case.

"For buildings of moderate height, say up to 125 feet as an extreme limit, reinforced concrete alone can undoubtedly be so designed as to give very good results when subjected to either earthquake or fire. But the bracing of a reinforced concrete building of any height, to resist earthquake, is a matter for serious study. The problem can be solved, but it has not been solved as yet. Any building of considerable height in an earthquake country should have as little mass in the superstructure as possible.

"For the ordinary commercial building where brick walls and wooden joists would ordinarily be used, I am of the opinion that reinforced concrete is the safest and most practicable solution in a place like San Francisco.

"Where reinforced concrete is used throughout, whether the building is very tall or not, great care should be taken with the design and execution of the connections between columns and members of the floor system. There should be heavy knee braces for the connection of all girders and beams, and, wherever possible, portal bracing in the shape of reinforced concrete arches should be introduced. Of course the amount of this work that needs to be done depends upon the circumstances in each individual case, such as the height of the building, its horizontal area, the kind of material, the dead weight in the upper stories, etc.

"It seems justifiable to conclude that a solid monolithic concrete structure of any sort is secure against damage in an earthquage country, unless it should happen to lie across the slip.

"The Baltimore and the San Francisco fires, as well as many other fires and fire tests, have proven conclusively that commercial methods of fireproofing are inadequate to stand any real test. In the majority of cases, the steelwork is fairly well protected, but the number of failures is sufficiently great to show that the factor of safety against fire is not by any means what it should be.

"For the protective covering itself to suffer complete destruction, or almost complete destruction, in any one fire, is in itself a failure, because, if it is brought to any such pass, the steelwork is very near destruction and the margin of safety is altogether too small.

"In my judgment, columns should be covered either with four inches of brickwork, laid in Portland cement mortar, and with all the interior space filled with concrete, or else they should be enclosed in an expanded metal basket and the entire interior filled with concrete, so that the minimum thickness of the concrete shall not, in any case, be less than four inches. Exposed flanges of girders should be protected by the equivalent of from one and one-half inches to two and a half inches of solid porous terra cotta, according to circumstances. If concrete is to be used, its thickness should be increased by about half an inch.

"The protection for lower flanges should always be enclosed in a basket of expanded metal or heavy lath wire, securely anchored into the side protection of the webs. The San Francisco fire showed that, even in a hot fire, such metal mesh basket work will largely retain its tensile strength, and thus hold in position the fireproof covering inside of it, even though the latter should be shattered by expansion stresses, or otherwise. The webs of girders should be covered by four inches of brickwork or concrete, built up on the lower flanges. Girders should be completely covered from bottom to top before the floor systems are put in, so that the collapse of the latter will not expose the girder. Floor beams should have solid, protecting skewacks, not less than one and one-half inches thick, or be covered with at least two inches of concrete. In important work, the protection of their lower flanges should also be encased in expanded metal or wire lath. The furred ceilings so much used in San Francisco are a valuable addition to the fire-resisting qualities of the floor construction and if the furring rods are more firmly secured, the total loss here, as a rule, would be measured by the value of the plaster alone.

"Hollow tile partitions should never be less than six inches thick.

"The results at Baltimore and San Francisco did not, by any means, indicate that hollow tile or concrete is altogether a failure or altogether a success. Both fires indicated very clearly that commercial methods of applying both materials are inadequate; both also indicated very clearly that successful results can be obtained with both materials.

"A conflagration never yields comparative results, but from such results as are available, I think there is no question that the best fire-resisting material available at the present time is the right kind of burned clay. By the right kind of burned clay is meant a good, tough refractory clay, almost as refractory as fire clay, made into proper shapes and properly burned. Some commercial hollow tile work is made of good material but, as a rule, that is the only good thing that can be said about it. As for concrete, there can be no question that good clinker concrete, made of well burned clinkers, Portland cement and sand is a very efficient fire-resisting material. It is better than anything else except the better types of burned clay products, but the form in which cinder concrete is commercially applied, is, on the whole, no better than the flimsy hollow tile work with which it competes; in fact, it is not certain that it may not be worse.

"If a hollow tile floor, for instance, loses its lower webs, the damage is very apparent, yet in the majority of cases, the floor remains true and capable of carrying considerable loads. Very often a cinder concrete floor which is even more seriously damaged, remains true, for the reason that the fire which damaged it, also removed its superimposed load before the damage was fully accomplished. A hollow tile which comes through a fire in which its temperature has

exceeded 700 or 800 degrees F., is inevitably damaged in all cases, owing to the dehydration of the cement, though it may seem undamaged to the casual observer. This property of concrete of maintaining a good face in spite of very real and very serious damage, is likely to lead the laymen into very dangerous conclusions. Consequently, this property of concrete construction may lead to equally dangerous practice. Inasmuch as concrete is inevitably damaged to a greater or less extent by the application of a high temperature, it would seem that, in all cases where reinforced concrete floor construction is used, a furred ceiling below it should be absolutely required.

"It should be added that attic floors and roofs should be as carefully designed to resist fire as any other part of the building. This is a thing that has rarely been done, and the experience of Baltimore and San Francisco show that it is absolutely necessary.

"While there is no doubt that commercial standards of fireproofing are dangerously inadequate, the greatest trouble of all is the fact that so little attention is paid to prtoecting the exterior openings in a building."

In summing up his views on the situation, Richard L. Humphrey says:

"The San Francisco disaster demonstrated that the lessons from the Chicago and Baltimore fires are still unlearned. The same faults in construction continue to be repeated. The only sure way to remedy grave defects of this character is to enact strict building laws which will compel an observance of the essentials for fireproof structures.

"Large conflagrations demonstrate that there is no such thing as a fireproof building. To label one as such is bad practice, since it gives a false sense of security, and causes a relaxing of necessary precautions.

"The lessons taught by the great calamities such as have befallen San Francisco, Baltimore and other cities, are not regarded. It is quite probable that the new San Francisco will to a large extent be a duplicate of the former city in previous defects of construction. The defects of construction which are so strongly condemned by reason of their failure are no worse than those generally practiced throughout the United States. The same defects are common and it is evident that the same results would follow an earthquake of equal intensity in another part of the country. A moment's consideration will show that the loss of life and property in New York, for example, under similar conditions, would be enormous. The damage to property in San Francisco is estimated at $250,000,000, but this sum, large as it is, is exceeded by the total expenditures for new construction in New York.

"In three days, the tremendous area of over 2,593 acres was burned, destroying entirely 490 city blocks, and in part 32 blocks. Of this 314 acres comprised the congested district, on which there was $250,000,000 insurance, probably representing a value of $500,000,000.

"In the Baltimore fire 1,343 buildings were destroyed, having an assessed value of $12,908,300. In two years these burned buildings were replaced by 570 buildings, whose assessed value is $20,000,000. These new buildings are larger than the old, and the widening of the streets has eliminated 700 building lots. It is expected that when the reconstruction within the burned district is complete, there will be less than 800 buildings, of which the assessed value will be fully $25,000,000.

"It is therefore quite reasonable to suppose that the assessed value of the reconstructed San Francisco will be at least double that at the time of the catastrophe.

"While reinforced concrete structures were few in the zone of seismic disturbances, these stood the test in a highly satisfactory manner. Rigidity and stiffness, and a high fire resistance, which are inherent qualities of concrete, demonstrated how admirably it is suited to resist this extraordinary test.

"It is evident that in earthquake countries, water supply pipes at least should be so laid as to avoid the action of slips, settlements or ground movements of all kinds. The pipe lines should also be arranged with gates and by-passes, making it possible to cut out that portion of the system which is crippled. There should also be some means of preventing the loss of water which is occasioned by breaks in the house service pipes. The early failure of the water mains rendered the city helpless and placed it at the mercy of the flames, the fury of which for three days threatened to complete one of the greatest disasters of recent years and to obliterate one of the most beautiful cities. It was finally checked by a combined influence of a change in the direction of the wind and a wide avenue.

"For a proper earthquake-proof structure, everything—the design, the materials used, and the workmanship—must be first class. Most of the failures resulted from bad design and poor workmanship, and in some cases, poor materials.

"The cause of the failures in San Francisco may be summarized as follows: First, dishonest design and construction, especially as regards municipal, county and state institutions. Second, an effort, on the part of those qualified to design, and advise on building construction to meet the owners' demands and erect structures for the least possible cost, which tends to a departure from the principles of correct design; the result is a structure that will carry ordindary loads, but that fails when subjected to unusual conditions.

"While two of the five sections into which the congested value district is divided involves only a mile of conflagrating hazard within their own limits, they are badly exposed by the others in which all elements of the conflagration hazard are present to a marked degree. Not only is the hazard extreme within the congested value district, but it is augmented by the presence of a compact surrounding, great height, large area, frame residence district, itself unmanageable from a fire-fighting standpoint by reason of adverse conditions introduced by topography. In fact, San Francisco has violated all Underwriters, traditions and precedent by not burning up. That it has not done so is largely due to the vigilance of the fire department, which cannot be relied upon indefinitely to stave off the inevitable.

"The destruction was greater because the fire was hotter than was the case in the Baltimore fire, due, as has been pointed out, to the inflammable surroundings and the unprotected openings, and to the unchecked sway of the flames.

"The lower webs of floor tile came off to perhaps a greater extent than in the Baltimore fire. It is said to be impossible to secure a suitable hard sawdust on the Pacific coast, such as is required in the manufacture of the porous terra-cotta tile. The tiles used are, therefore, more dense and of poorer quality.

"The question of fire-proofing, however, is of one degree, being dependent on the intensity and duration of the fire. A column may be properly fire-proof for an office building, but entirely insufficiently fire-proof for a warehouse; or a column which may be all right for the upper stories, may fail in the basement, as in the case of the Kamm Building.

"Buildings should be self-contained, protected against exterior fires and capable of fighting fire from the inside, and in earthquake countries where service is likely to fail, it is highly essential where possible, to have an independent supply, as from an artesian well with the necessary pumps and service pipes.

"The indiscriminate dynamiting in San Francisco did more harm than good, for the reason that the concussions damaged the surrounding buildings, as in the case of the Postoffice building, where the damage was extensive.

"The conditions at San Francisco were unusual, and even had not the water supply failed, it is doubtful whether it could have been controlled for the reason that so many fires at a time would have made it impossible for the fire department to handle them efficiently, especially since there was such a large number of combustible, non-fireproof structures."

SOME NEW METHODS IN HIGH-TENSION LINE CONSTRUCTION.*

By H. W. Buck.

The great economies in the cost of generating power which have been obtained in the large stream turbine stations and hydroelectric plants, are leading to the general abandonment of small generating stations and the increase in transmission distances in order to distribute power over a large territory. In other words, 100,000 h.p. can be generated in one station and transmitted 100 miles, cheaper than it can be generated and distributed from ten 10,000-h.p. stations near the center of load. On account of this tendency toward the concentration of generating units, the overhead transmission line has assumed a position of great importance in electrical installations, and the same permanency and reliability is demanded of it as of the generating station itself. The wooden pole line of the past has been practically abandoned and steel construction has been substituted.

The long distances covered by many of the modern lines, the large amounts of power to be transmitted, and the very high price of copper and aluminum—all have combined to force up the transmission voltage to the highest practicable limit. In consequence the demand for high-voltage overhead line insulators has outgrown the present standard practice, and some new systems will have to be introduced to meet the new conditions.

The method of line construction here described has been developed by the writer and Mr. E. M. Hewlett and is believed to offer a means of operating lines safely at higher potentials than is practicable with insulators of the pin and petticoat type.

Fig. 1 illustrates in a diagrammatic way the arrangements for one circuit. The tower supports shown here are those which were used merely for experimental work and need not be considered as a commercial design. Each span is dead-ended at each support as shown, through a series of insulating units which in this case are plain discs connected together with steel links. The various spans are then electrically connected by jumpers hung below the insulators. The insulators

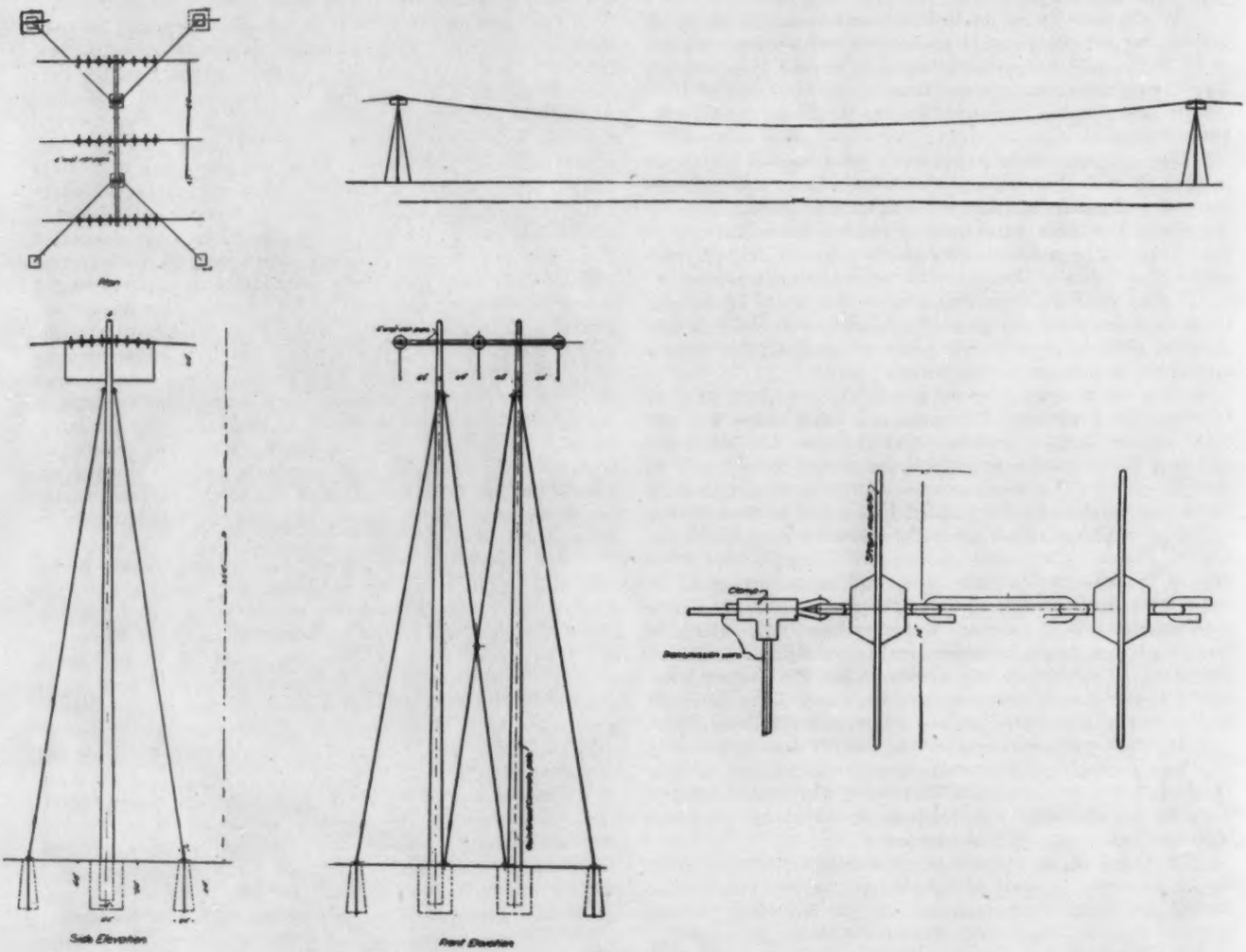

Fig. 1.

are directly attached to the cross-arms, eliminating all pins. The number of discs linked together in series depends upon the line voltage, the discs themselves being identical for all voltages.

Fig. 2 illustrates a design for a 100,000-volt two-circuit line which is soon to be constructed for transmitting 50,000 h.p. 165 miles. The spans in this case will range from 500 to 1000 feet in length. Here the line is suspended below the cross-arm on most of the towers. The lines will be dead-ended with jumper connection as shown only at angles and on tangents at about every fifth tower. This dead-ending will be for the purpose of stopping any creeping of conductors on the line as a whole, to check the transmission of

*Paper presented at the Convention of the American Institute of Electrical Engineers, June 26, 1907.

longitudinal waves along the conductors due to wind, and on curves to take the side stress of the conductor due to change in direction. In this installation the lines will not be triangulated, but at suitable intervals along the lines the conductors will be transposed so as to balance up effects of mutual static and magnetic induction. Special cross-arms will be installed at transposition towers.

Fig. 3 illustrates another design for a two-circuit line which is to be built for 80,000-volt operation. The spans in this case will range from 300 to 400 feet and the conductors will have an approximate triangular relation. The conductors will be suspended by a series of insulators from the cross-arms as in Fig. 2 with occasional rigid attachment, for the reasons given above.

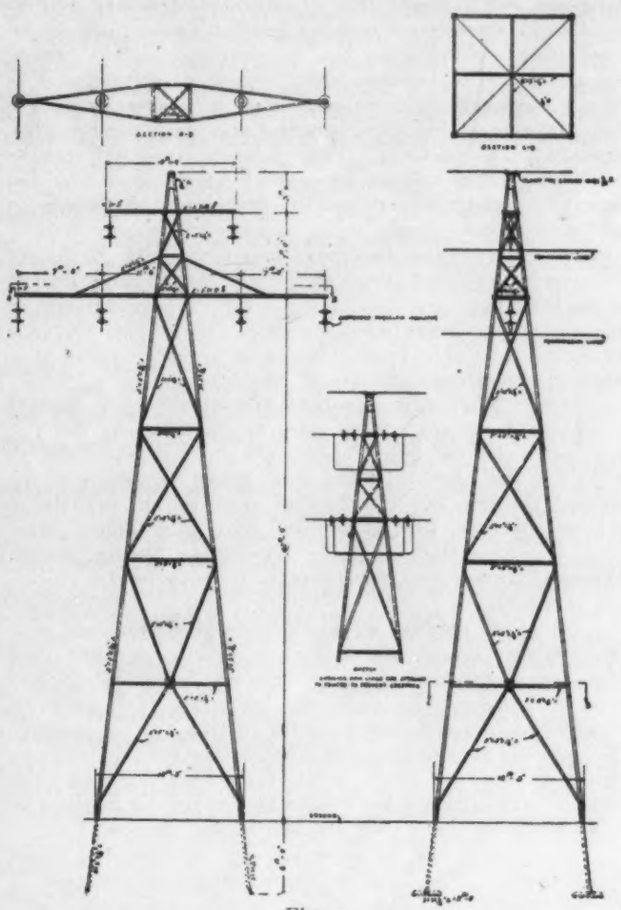

Fig. 2.

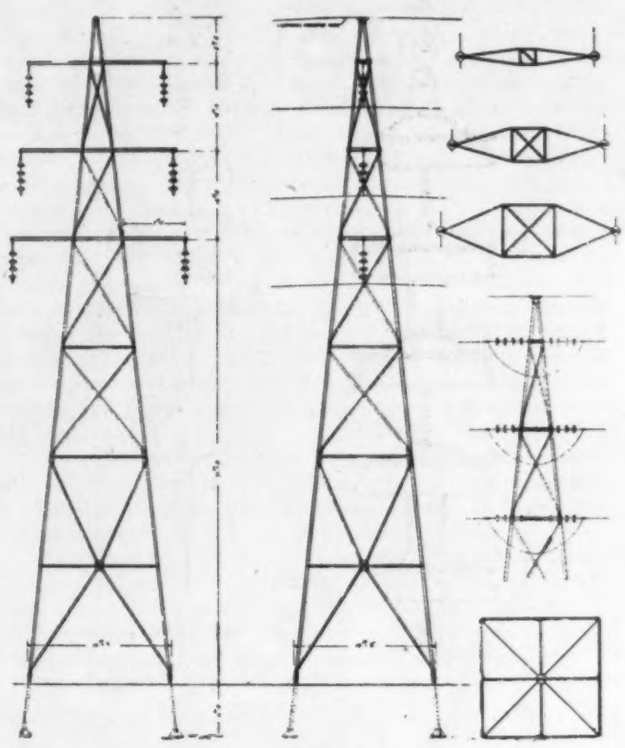

Fig. 3.

Fig. 4 shows a method of assembly of the insulators for suspension under a cross-arm. Fig. 5 illustrates a method of assembly where spans are dead-ended at the cross-arm with jumper connection.

The advantages of this construction, which might be termed "series unit insulation," over the pin and petticoat type may be summarized as follows:

(a) With the standard type of pin insulator now used the difficulties of construction increase very rapidly at the higher voltages. The cost of insulator for a given margin of safety increases for voltages above 60,000 nearly as the cube of the increase in voltage. Either very large petticoat diameters must be used, or very high insulators with many petticoats. In either case the manufacture of the porcelain parts is a difficult and expensive matter, and with the long pin necessary, the mechanical stresses from the line on insulator, pin, and cross-arm are objectionable. With the series unit system here proposed, the cost of insulator progresses only in direct proportion to the increase in voltage, the only change being in the number of units in series. There is practically no limit to the degree of insulation obtainable.

(b) One of the most difficult elements of design in a transmission tower where long pins and petticoat insulators are used, is to obtain a cross-arm which will resist the torsional stresses due to the leverage of the pin. With the pin entirely eliminated, the stresses are directly applied to the cross-arm; this cheapens the construction of the tower.

(c) In the arrangements shown where the insulating units are attached on either side of the cross-arm, taking the full tension in the line with jumper connection between spans, the insulation can be increased indefinitely by adding discs in series without increasing the space occupied on the tower.

(d) Where each span is dead-ended, as in (c), all faces of the insulating units are exposed to the cleansing action of the rain, so that dirt cannot accumulate thereon. This arrangement also prevents the dripping water from forming electrical communication between units as occurs from one petticoat to another in the pin type of insulator.

(e) A standard insulating unit can be adopted for all voltages, the only variation being in the number linked in series. This simplifies the manufacturing problem.

(f) If any insulating unit becomes damaged or completely shattered, the insulation of the remainder is not affected. The damaged unit can be replaced without the necessity of renewing the whole.

(g) If a tower is directly struck by lighting the cross-arms will be likely to take the discharge, since they are above

the lines, whereas in the pin type of insulator the line is usually the highest point.

(h) In long-span installations where the conductor at each end of the span is tied fast to an insulator mounted on a pin, experience has shown that crystallization is apt to take place in the conductor at the tie, due to its rigidity at that point and the vibrations in the span. This frequently results in breakage of the conductor. The flexible connection between conductor and cross-arm afforded by the series of insulators should reduce this tendency to crystallization, and should therefore permit spans of any length to be used without further precautions against this action.

Fears may be expressed that with the conductor suspended under the cross-arm, serious swinging to and fro might take place. From numerous observations it is believed that no such swinging will occur. Long aerial spans under wind pressure take a permanent and steady deflection throughout the span proportional to the average wind velocity along the

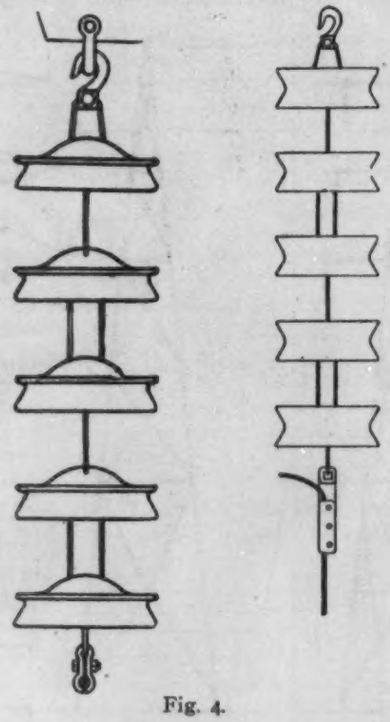

Fig. 4.

span, and no indications have been observed of long spans responding to so-called gusts. The towers shown in this paper are designed so that the conductor can safely be deflected by the wind about 60 degrees on either side of the neutral position.

Insulators of a great many forms have been built and tested, but the one which gives the best results electrically and mechanically is the link type developed by Mr. Hewlett and having the grooved or fish-tail periphery. Four of these in series is sufficient for 100,000-volt operation with a liberal factor of safety.

A very important element in this construction is of course the methods of fastening the insulating units together and attaching them to the line and cross-arms. This can be accomplished in many ways and several methods have already been worked out, but these details are beyond the scope of this paper. Further experience in practical line construction and operation under this system will demonstrate the best methods of installation and attachment.

THE VALUE OF ENGLISH TO THE TECHNICAL MAN.*

By John Lyle Harrington.

The technical man, that is, the engineer, the architect, and the applied scientist of every kind, finds a sound, accurate knowledge of the language essential to him in every part of his work. A wide and precise knowledge of words is required in his reading as well as in his general writing; in his business and professional conversations even more than in those of a social nature. But, in the preparation and interpretation of technical correspondence, specifications, and contracts, the use of perfect language reaches the highest degree of importance.

The technical man of the highest order is not only a cultered gentleman, versed in all the amenities of polite society, familiar with the best literature in his own language and probably that of one or two others, able to read many branches of learning understandingly and to discuss them intelligently; but, in addition, he has special knowledge of mathematics and the applied sciences, and he is not only able to understand what is written or spoken but can express his own thoughts regarding them readily, accurately and logically. The successful technical man, it has been well said, must know much about everything and everything about something, but his ideas and knowledge are of small value except in so far as he can convey them to others; for, since he does not often labor with his hands, he must instruct and direct those who do. Thus, language is his most important tool, and it certainly behooves him to see that it is always in good order. His reputation as a gentleman and as a professional man depends very largely upon his knowledge and use of English.

Perfect English is impossible, for there is no absolute standard. Read any critical work on the language and you will find exhibited examples of faulty construction and of erroneous use of words taken from books by writers of the highest repute. But the English employed by writers of the highest rank, such as Milton, Goldsmith, Gibbon, Macaulay, Johnson, Hallam, Hume, Hawthorne, Motley, Irving, Prescott,, Ruskin, and Stevenson, is the most perfect standard attainable.

The whole purpose for which language is employed is to impress our thought upon others in such a way that they shall feel or think or act as we desire. To attain this end it is essential that we make intelligent use of the arts of rhetoric and oratory, that we know the laws of composition, the methods of ordering and constructing our discourse so that it will lead the minds of our hearers wherever we wish, and not only convey our thought but induce our auditors to think along the lines that will benefit our purpose.

The style of the discourse must be pleasing and suited to the object. Especially for the technical man's purpose, it should be crisp and clear. Short words of English origin are invariably stronger and more rugged than their longer and more elegant synonyms which are derived from the Latin or Greek; hence their use is nearly always to be preferred except where the subject matter is abstruse of where nice distinctions in meaning are important.

It is deplorably rare to find young technical men in possession of an intimate knowledge of rhetoric. Business correspondence is often annoyingly protracted because one or both of the parties conducting it ignore the simple law of unity and fail to round out and complete the subject under discussion. Errors of style and gross errors of composition are quite as frequent in the correspondence of the technically educated man as they are in that of the ordinary

*Extracts from an address to the Technological Society of Kansas City, the Engineering Society of the University of Missouri, and the Civil Engineering Society of the University of Kansas.

clerk who went to work when he left the grammar school. It is because engineers are so little accustomed to order their thought and language properly that they have so little part in the business and correspondence of the corporations which employ them. It is notorious that a technist is rarely a good business man. This is partly because of the exaggerated importance he gives to technical matters, but very largely because his thought is clumsily expressed and awkwardly ordered.

The character of the professional man's language is important in his social and business correspondence; in the promulgation of orders, rules, and regulations for the guidance of those under his direction; in the preparation of specifications, contracts, and reports; in writing and delivering addresses and technical papers; and in writing technical books for the advancement of his profession.

A technical man is, presumably, an educated man; and if he do not speak like one, suspicion is cast upon the entire range of his learning. When a man cannot spell correctly, or use ordinarily good grammar (and there are many university men who cannot) it is difficult to convince others that he is professionally able. The great majority of technical men occupy salaried positions in the organization of railways, governments, constructing companies, and manufacturing corporations. These positions are obtained by means of acquaintances made in a social way, by interview, by correspondence, or on account of an earned reputation. Yet I have granted interviews to many technical men who spoke like laborers, and have received hundreds of letters from them that would be a disgrace to a grammar school scholar. There are technically educated men who say "I have saw," "I seen," and "I done;" and there are men in high places who require no further proof of the speaker's deep ignorance, not only of English but of technical matters as well. One who is thus ignorant of the language finds social progress substantially impossible. This may seen a trivial matter and foreign to our purpose, but it is not. Matters of very large impotance are often settled by favor, and favor frequently follows social position. Other things being equal, almost anyone will show his friend the preference in business and professional matters. It is even common to stretch a point in favor of a friend.

The detrimental results of bad English in conversation or in correspondence are by no means so certain as in the more formal technical papers. In the preparation of articles for the technical press, and papers for the learned societies, there is time to study form and style and to eliminate errors due to haste; hence, when such matters are ill written, it is not unfairly argued that the writer is ignorant of the correct use of the language. Such an opinion, widely disseminated, as it is likely to be when it originates thus, is exceedingly detrimental to the writer. It weakens his arguments, causes him to be misunderstood, or so detracts from the interest of his readers that the matter is not read. The idea that a technical paper is dry at best, and that the English employed in it is of small consequence, has long been proved incorrect. There is so much nowadays that is well written that no busy professional man is willing to spare the extra time and effort necessary to read and digest an ill-written paper.

A merchant may advertise his wares, a manufacturer his product, but reasonable modesty and his code of ethics prevent a professional man from advertising his skill. If he does not become known by his work or his writings, he remains in comparative obscurity. His ability is clearly exposed in his writings, in which he gives to the profession his best thought; and if he cannot write easily and well he will probably not write at all, for the censorship of the learned critics is now severe and is rapidly growing more so. Every normal, healthy-minded technical man desires to leave a permanent record of the results of his best thought and work to aid his co-workers and those that come after him. An ably written description of work performed, discoveries made, or methods developed accomplishes more for the advancement of science than many well-designed and well-executed constructions. The latter benefit those who see them; the former may help all who can read.

Provoking and expensive errors often arise from the misunderstanding of badly expressed orders, rules and regulations. In large corporations, especially in railway, contracting and engineering companies where employees are distributed over a wide area, it is impossible for an officer to give individual instructions, or to see personally that they are carried out; hence, general instructions must be so clear that they cannot be misunderstood or evaded. It is hardly necessary to say that the consequences of a mistake in train orders, instructions regarding breaking track for repairs of renewals, or for making temporary construction to span washouts, may result in expensive and fatal accidents. And even minor errors, oft repeated, may prove very costly.

But the preparation of reports, specifications and contracts is the most particular and momentious task the technical man has to perform. A misused word, a phrase whose meaning is ambiguous, a paragraph that is confused, or the omission of a direction or a precaution, may result in great damage to both the client and the technical man. It is not enough to be careful in a general way. Every word, every phrase, every sentence, has a direct and vital bearing on the work governed by the documents. I have known the presence in a contract of a single word of equivocal meaning to cost one of the parties many thousands of dollars, though when the contract was drawn there was no question regarding the intent of the parties to it. There is no more certain way for the engineer to protect his own and his client's interests than to prepare all documents in accordance with the best English usage as well as with technical skill; and there is no surer way to lay the foundation for trouble and financial loss than to neglect the character of his language.

Notwithstanding the vital importance of clear, concise and full expression in such documents, it is not uncommon to find specifications and contracts so bad in their construction that they fail utterly in their purpose.

Very few railway specifications for complicated structures are so well written that a contractor cannot comply with them to the letter, yet give the company construction far inferior to what the writer of the specifications intended, and thereby gain for himself material advantage.

The lawyers and the courts are kept busy rectifying the blunders of other professional men who do ill what they are paid to do well. I know of one contractor who has grown gray in the business of constructing buildings, who has never completed a contract without a lawsuit, and who has never lost a lawsuit. This speaks ill for the work of the architects under whom he worked, yet they are probably no worse than their fellows. If it were not good policy to be reasonably honest, many another contractor might easily approach his record.

It is not given to every one to speak and write fluently, for style of the highest order is a rare gift; but if good, vigorous English be employed, a good, clear, characteristic style will soon be developed, the thought will be well impressed upon the audience, and the influence of the writer will be correspondingly strengthened.

A thorough study of one or two good books which treat each phase of the study of English, the reading of literature of the best classes, and reasonable watchfulness over one's everyday writing and conversation will inevitably result in habitually correct use of the English language.

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VOL. XIX AUGUST 3, 1907 No. 5

EDITORIAL.

The Duty of the Juror, and his Treatment by The People.

The failure of the jury in the Glass trial to arrive at a verdict was not received with that burst of public indignation which some of the San Francisco newspapers would make one believe, if he reads therein the savage and totally unwarranted, as well as indefensible assaults upon the five jurymen who refused to accept the evidence as presented by the prosecution as sufficient to convict the defendant of the crime of bribery.

Such assaults upon jurymen, who, it is reasonable to suppose, discharged their arduous and invidious duties faithfully and to the best of their ability, are not only discreditable, but form a serious menace to one of the most treasured institutions and safeguards of this Republic. The sanctity of the jury system should be jealously guarded by an upright press. To impugn a juror's honesty because he does not arrive at the conclusions desired by a newspaper or an individual, and to expose him to public contempt, is to strike at the root of American institutions of liberty and justice.

It is all too common to find the public press in California attempting to usurp the functions of the courts. Men accused of crime are subjected, too frequently, to a harder ordeal by being tried in the columns of the newspapers than in any court. Such preliminary, unwarranted, and one-sided treatment of the case is calculated to create prejudice against a defendant. Nowadays everybody reads the newspapers, and it is impossible for the reader to escape the impression — sometimes absorbed unconsciously — of what he reads. Hence the average juror is usually handicapped by what he has read of the case, frequently presented by an interested newspaper in an extremely partial and unfair form. It is difficult enough for the average citizen, when he finds himself upon a jury, to divorce his mind entirely from the prejudices which he has absorbed while reading newspapers which are either hostile to, or prejudiced in favor of, the defendant. When to this apparently inevitable handicap is added the intimidation of the press, the juror's difficulties are tremendously increased, while the security of the State is menaced. Even the prosecution felt impelled this week to protest against the savage denunciation of the five jurymen who voted for Glass's acquittal. In an interview the Assistant District Attorney, Mr. Heney, said: "I have no comment to make on the action of the Glass jury. The independence of jurors in the jury-room should be guaranteed above all other things. It is more important to the American people than the conviction of Louis Glass."

The object of such tactics of intimidation on the part of the press is transparent enough. They intend not only to hold up to public contempt the jurymen who have disappointed them, but to influence future jurors. In effect, such newspapers say: "Unless your verdict is in accordance with our plans and desires, we shall brand you as being improperly influenced. We have already tried these cases in our own columns, and by the evidence our detective-reporters have gathered, and from the information we have received from every available source, we are convinced of the guilt or innocence of the persons you are about to try. It only remains for you to hand in your verdict in accordance with our findings, which you will not hesitate to do if you are a good citizen."

This is no exaggeration of the presumptuous, arrogant and, indeed, insufferable attitude of a portion of the press. The much vaunted liberty of the press has become license, which seriously encroaches upon civic liberty and aims at the heart of justice.

Surely it is the function of the courts to throw every protection possible around those who serve on juries. The sacred cause of justice demands that jurymen should enter upon their duties absolutely free and untramelled, without thought of fear or favor. If a

juryman knows that he is liable to be exposed to the invective of a newspaper, should his opinion not coincide with an editor's desires, his freedom of thought and action, his impartial deliberation is necessarily impeded. It would be well within the province of a judge who has watched the painstaking and conscientious labors of a jury, to rebuke with stern voice such wanton attempts on the part of the press to obstruct the course of fair jury trial—to pervert justice.

A portion of the local press seems to imagine itself entirely superior to the ordinary process of the law. It not only impugns vehemently the motives and actions of men in every walk of life, but it anticipates trials, it criticizes judges while still conducting cases, and it presumes to discipline jurymen. Such practices are obviously against civic liberty and judicial institutions. We want no Lynch Law in California, arising either from the riot of mobs or the intimidation of newspapers. Whatever feeling the press may contrive to manufacture toward men indicted for crime, the accused should at least be afforded the right of fair, open and unprejudiced trial by a jury of his fellowmen, no member of which has reason to fear the consequences of handing in a verdict in accordance with the law and evidence as brought forth during the trial.

COPPER MARKET SITUATION.

The feature of the copper situation which has claimed more than an ordinary share of interest lately was the reduction made last week by the leading producers of 3¼ cents per pound in the price of electrolytic copper. The Calumet and Hecla Company also lowered the selling price of its output to 23 cents from its previous high price of 26½. Present quotations made by the large producers and principal selling agencies are 22 for electrolytic wire bars, and 22⅛ to 23 for brands of Lake Superior mines. Some very large sales are reported both for export and to domestic buyers at the concessions made, but there has been no rush on the part of consumers generally to buy heavily at the reduced prices.

Buyers had become accustomed to quotations of 22½@ 23 for some time before the new schedule of copper prices was made by the larger interests. While the principal producers were maintaining a nominal price of 25¼ recently, there were sellers anxious to do business for much less money, and an unhealthy situation surrounded the whole market, which greatly interfered with the exercise of complete confidence in the market. Reliability and steadiness could not find a favorable soil for their development under such contrary conditions, and buyers generally were confused over the outlook. Although the wide price discrepancies no longer exist, there is, however, a number of features exerting their influence to encourage a spirit of hesitation among buyers which will require many sound arguments to fully dispel.

There is probably considerable copper in the hands of consumers carried over from old contracts, and the apathy of some of the prominent manufacturers would seem to confirm the belief that supplies of raw material are by no means exhausted. The effect of the recent reduction in prices has served to encourage outside offers in this country and Europe below the official price lately announced. These cheap offers lead buyers to adhere to the hand-to-mouth policy of buying, and tend to still further confuse the minds of the trade.

The situation is not without its bright features, notwithstanding the presence of certain conditions which have a tendency to rein in enterprise for the time being. Business is getting down on a more normal plane, and the disposition to embark upon rash ventures has received a wholesome check. The ideas of the financial and industrial world are not quite so inflated as they were, and people are beginning to realize that there is a limit to expansion methods. The kernel of the situation, as we understand it, lies in the present unsatisfactory condition of the money and bond markets. No permanent improvement can be looked for until it becomes possible to finance new enterprise with greater facility than can be done at present. The trouble is not with the price of copper per se, but the root of the difficulty is traceable to the inability of various utility corporations to secure the necessary funds against bonds whereby the money can be raised for executing contemplated improvements. A curtailment of business would send money into other channels, and investment funds would gradually become available for purchase of bonds, and with a ready market for the latter work already mapped out could be taken up and carried through successfully.

PERSONAL

H. C. Thaxter has returned from an extensive Eastern trip.

C. L. Cory has returned to San Francisco from Salt Lake City.

Chas. Derleth, Jr., has resigned as editor of the American Builders' Review of San Francisco.

R. B. Daggett, manager of the San Francisco office of the Electric Storage Battery Co., with general offices at Philadelphia, Pa., announces the removal, on July 29, 1907, of its San Francisco office from temporary quarters at its warehouse, No. 11 Hawthorne Street, to permanent quarters in the Crocker Building.

TRADE CATALOGUES.

Cost of Tarviating Macadam Streets, from information furnished by Mr. Linn White, engineer of the South Park Board of Commissioners, Chicago, Ill., contains valuable information for the good-roads engineer. It is sent by the Barrett Mfg. Co., New York City.

The Sprague Electric Company of New York City has issued a new instruction book which illustrates and describes in detail the installation of Greenfield flexible steel conduit and flexible steel-armored conductors. This book is 3 by 5½ inches in size, and contains 44 pages of valuable information on a subject of importance to all who have to do with the wiring of either private or public buildings.

PUBLICATIONS RECEIVED.

"Catalogue of Earthquakes on the Pacific Coast, 1897 to 1906," by Alexander G. McAdie, being part of Vol. XLIX of the Smithsonian Insititute.

LOCAL STOCKS AND BONDS

Furnished by Courtesy San Francisco Stock and Bond Exchange.

Outstanding	INTEREST	MISCELLANEOUS BONDS.	JULY 26		JULY 27		JULY 29		JULY 30		JULY 31		AUGUST 1	
			Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked	Bid	Asked
1,532,000	F & A	Associated Oil Co. 5%	80¼	.....	80¼	.....	80¼	.....	80½	82	80	82	.....	81
2,250,000	M & S	Bay Counties Power Co. 5%	.....	98	.....	98	.....	98	.....	99	.....	99	93	100
1,000,000	F & A	Cal. Central Gas & El. 5%	.....	.....	.....	.....	.....	102½	.....	102½	.....	102½	.....	.....
9,600,000	M & S	Cal. Gas & El. Gen. M. & C. T. 5%	78½	80	79¾	80¼	.....	80¼	.....	80¾	79½	80	79¾	80
900,000	J & J	California St. Cable Co. 5%	98	101	98	101	98	101	98	101	98	101	98	101
2,000,000	J & J	Contra Costa Water Co. 5%	.....	101	.....	101	.....	101	.....	100¾	.....	100½	100	100¼
1,000,000	J & J	do do Gen. Mtg. 5%	.....	96	.....	96	.....	96	.....	96	.....	96	.....	96
623,000	F M A N	Edison Light & Power 6%	.....	115	.....	115	.....	115	.....	115	.....	115	.....	.....
650,000	M & S	Ferries & Cliff Ho. Ry. 6%	103	.....	103	.....	103	.....	103	.....	103	.....	103	.....
671,000	A & O	Geary St. Ry. 5%	52	.....	52	.....	52	.....	52	.....	52	.....	52	.....
610,000	M & N	Honolulu R. T. & L. Co. 6%	105½	.....	105½	.....	105½	.....	105½	.....	105½	.....	105½	.....
300,000	A & O	Lake Tahoe Ry. & T. Co. 5%	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½
500,000	J & J	Los Angeles Elec. Co 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
1,300,000	J & J	Los Angeles Gas & Elec. Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
5,000,000	A & O	Los Angeles Ry. 5%	109½	110½	109½	110½	109½	110½	109	.....	109	.....	109	.....
1,000,000	A & O	Los Angele Lighting Gd. 5%	.....	105	.....	105	.....	105	.....	105	.....	105	.....	103
1,500,000	A & O	Los Angeles Pac. R. R., 1st Con. Mtg. 5%	102¾	.....	102¾	.....	102¾	.....	102¾	.....	102½	.....	102¾	.....
3,030,000	M & S	L. A. Pac. R. R. of Cal. 5%	99¾	101	99¾	101	99¾	101	.....	101	.....	101	.....	101
3,000,000	J & J	Market Street Cab'e 6%	108	.....	108	.....	108	.....	108	.....	108	.....	108	.....
5,141,000	M & S	do Ry., 1st Cons. Mtg. 5%	103½	108	103½	108	103½	108	103½	108	103	.....	103½	.....
100,000	A & O	Mill Valley & Mt Tamalpais S.Ry. 5%	103	.....	103	.....	103	.....	103	.....	103	.....	103	.....
4,751,000	A & O	Northern Ry. Co. of (Cal.) 5%	112	.....	112	.....	112	.....	112	.....	112	.....	112	.....
1,498,000	J & J	North Pacific Coast R. R. 5%	100¾	.....	100¾	.....	100¾	.....	100¾	.....	100¾	.....	100¾	.....
1,074,000	J & D	Northern Cal. Railway 5%	.....	.....	.....	.....	.....	.....	102½	.....	102½	.....	102½	.....
980,000	J & D	Northern Cal. Power Co. 5%	.....	100	.....	100	.....	100	.....	99	.....	99½	.....	99½
6,000,000	A & O	Northern Electric Co. 5%	.....	97½	.....	97½	.....	97½	.....	97½	.....	97½	.....	97½
1,000,000	M & S	Oakland Gas Light and H. 5%	100	.....	100	.....	102	.....	103½	.....	103	.....	103	.....
1,374,000	J & J	Oakland Transit Co. 6%	109	112	109	112	109	.....	109	112½	.....	112½	109	.....
1,600,000	J & J	Oakland Transit 5%	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....	102½	.....
1,326,000	J & J	Oakland Transit Con. 5%	102	102½	102	102½	102	102½	102	.....	102	102½	102	102½
7,000,000	J & J	Oakland Traction Con. 5%	97½	100	97½	100	.....	100	.....	100	.....	100	.....	100
1,500,000	J & J	Oakland Water Co. gtd. 5%	.....	98	.....	98	.....	98	.....	98	.....	98	.....	98
2,000,000	A & O	Omnibus Cable Ry. 6%	108½	112	108½	112	108½	112	108½	112	108½	112	108½	112
1,149,000	S D M J	Pacific Gas Imp. 4%	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½
8,494,000	J & J	Pacific Electric Ry. Co. 5%	103½	104¼	103	104¼	103½	.....	103¼	.....	103¼	103¾	103½	104
4,491,000	J & J	Pacific Light & Power Co. 5%	.....	100¼	.....	100¼	.....	100¼	.....	100¼	.....	100¼	.....	100¼
3,000,000	J & J	Pacific Tel. & Tel. Co. 5%	.....	103	.....	103	.....	103	.....	103	.....	103	.....	103
350,000	J & J	Park & Cliff House Ry. 6%	102½	104	103	.....	.....	105½	.....	105½	.....	105½	.....	103½
250,000	J & J	Park & Ocean R. R. 6%	102	.....	102	.....	102	.....	102	.....	102	.....	102	.....
700,000	M & S	Powell Street Railway 6%	.....	107½	.....	107½	.....	107½	.....	107½	.....	107½	.....	107½
2,500,000	M & N	Sacramento Elec. Gas & Ry. 5%	.....	.....	.....	.....	.....	101¼	.....	101½	100	101½	.....	101
6,000,000	A & O	S. F. & S. J. Valley Ry. 5%	.....	.....	.....	.....	113	.....	113	.....	113	.....	113	.....
3,000,000	J & J	S. F., Oak. & San Jose Ry. 5%	103½	.....	103¾	105	103¾	105	103¾	.....	103¾	104	.....	104
1,500,000	J & J	do do 2d Mtg. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1,500,000	A & O	S. J. & S. Clara Co. R. R. 4½%	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
642,000	A & O	Sierra Ry. of Cal. 6%	105	.....	105	.....	105	107½	105	107½	.....	107½	.....	106
6,000,000	J & J	S. P. R. R. of Arizona 6% (1909)	.....	.....	.....	.....	.....	.....	.....	.....	100½	101½	100½	101½
4,000,000	J & J	do do do (1910)	101¾	.....	101¾	.....	101¾	.....	101¾	.....	101¾	.....	101¾	.....
5,116,000	A & O	S. P. R. R. of Cal. 6% (1912)	108	.....	108	.....	108	.....	108	.....	108	.....	108	.....
4,127,500	M & N	S. P. R. R. of Cal., 1st c. gtd. 5%	114	117	114	117	114	117	114	117	114	117	114	117
3,533,000	A & O	S. P. Branch Ry. of Cal., 6%	125	128	125	128	123½	.....	123½	.....	123½	.....	123½	.....
81,178,000	J & J	S. P. R. R. Co., 1st Ref'd'g. 4%	91¾	91¾	91	91½	91	91¾	.....	91½	90¾	91¼	90¾	91¼
17,500,000	J & D	Spring Valley Water Co. Gen. Mtg. 4%	84	85	84	85	84	85	.....	84	.....	84	.....	84
300,000	M & S	Stockton Gas & Elec. Co. 6%	100	.....	100	.....	100	.....	100	.....	100	.....	100	.....
2,000,000	J & J	United Gas & Elec. Co. 5%	.....	100	.....	100	.....	102½	.....	102½	.....	101	.....	101
20,000,000	A & O	United R. R. of S. F. 4%	71¼	.....	71⅛	.....	71⅜	.....	71⅜	71½	71¼	71½	71¼	71½
2,500,000	M & N	Valleys Counties Power Co. 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
		Water Stocks.												
.....	.....	Contra Costa	.....	62	.....	62	.....	62	.....	62	.....	62	.....	62
6,000	Quarterly	Marin County	.....	62	.....	62	.....	62	.....	62	.....	62	.....	62
280,000	.....	Spring Valley Water Co	20	20¼	20	20¼	20	20¼	20	20⅛	20	20⅛	20	20¼
		Gas and Electric Stocks.												
37,500	.....	Martel Power Co	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
9,340	.....	Mutual Electric Light Co. (Ctfs.)	4½	.....	4½	.....	4½	.....	4½	.....	4½	.....	4½	.....
37,336	.....	do (Extended Ctfs.)	.....	13	12¾	13	12¾	13	12¾	13	12¾	13	12¾	13
40,000	Monthly	Pacific Lighting Co	65	.....	65	.....	65	.....	65	.....	70	65	.....	.....
12,000	.....	Stockton Gas & Elec. Co	52	.....	52	.....	52	.....	52	.....	52	.....	52	.....
		Street Railroad Stocks.												
10,000	.....	California	.....	140	.....	140	.....	140	.....	140	.....	140	.....	140
10,000	.....	Geary	.....	41	.....	41	.....	41	.....	41	.....	41	.....	41
10,000	.....	Presidio	.....	25	.....	25	.....	25	.....	25	.....	25	.....	25
	Semi-an.	Associated Oil Co	29¾	.....	32	.....	31¾	31⅞	31½	32½	31½	32¼	31½	32
1,625	Quarterly	Mill Valley & Mt. Tamalpais S. Ry	.....	110	.....	110	.....	110	.....	110	.....	110	.....	110
180,000	Quarterly	Pac. Tel. & Tel. Co. (Pfd.)	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
180,000	.....	Pac. Tel. & Tel. Co. (Common)	7½	15	7½	15	7½	15	7½	15	7½	15	7½	15

Unlisted Securities

750,000	A & O	Ba Counties Power Co. 6%	.....	103½	.....	103½	.....	103½	.....	103½	.....	103½	.....	103½
745,000	M & S	Blue Lakes Water Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,000,000	A & O	California Northwestern Ry. 5%	.....	108	.....	108	.....	108	.....	108	.....	108	.....	108
160,000	J A J O	Marin County Water 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
600,000	J & J	Risdon Iron Works 5%	.....	100	.....	100	.....	100	.....	100	.....	100	.....	100
500,000	M & S	S. F. Dry Dock 5%	.....	109	.....	109	.....	109	.....	109	.....	109	.....	109
8,000,000	M & N	S. F. Gas & Electric 4½%	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
2,926,000	J & J	S. F. & North Pacific Ry. 5%	103½	.....	103½	.....	104	.....	104	.....	104	.....	104	.....
5,500,000	J & J	South Pacific Coast Ry. 4%	.....	95	.....	95	.....	95	.....	95	.....	95	.....	95
.....	.....	Standard Electric Co. 5%	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½	.....	92½
.....	.....	do do Gtd. 5%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	87½
750,000	J & J	Sunset Tel. & Tel. Co. 6%	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2,250,000	A & O	Sunset Tel. & Tel. Co. 5%	.....	105¼	.....	105¼	.....	105¼	.....	102½	.....	103½	.....	103½
1,000,000	M & N	Sutter Street Railway 5%	.....	105	.....	105	.....	105	.....	105	.....	105	.....	105
		Stocks.												
50,000	Monthly	Gas Consumers' Association	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
100,000	Monthly	Northern Cal. Power Co	24½	25	24	25	24	25	.....	25	24	25	24	25
.....	.....	Pac. Gas & Elec. (Pfd.)	32½	37½	30	45	30	37½	34	37½	35	37½	37½	.....
.....	.....	Santa Cruz Port. Cement	50	.....	50	.....	50	.....	50	.....	.....	55	.....	55
.....	.....	Standard Port. Cement (New)	.....	55	.....	55	.....	55	.....	55	.....	55	.....	55
50,000	Monthly	Truckee Electric Co	15	.....	15	.....	15	.....	15¼	.....	14½	15½	.....	15¼

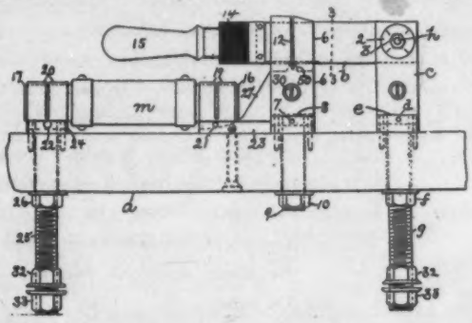
PATENTS

Electric, Gas and Water.

Specially reported for the Journal of Electricity, Power and Gas.

Electric Switch. 860,432. Johan M. Andersen, Boston, Mass., assignor to Albert and J. M. Anderson, Manufacturing Company, Boston, Mass., a corporation of Maine. Filed October 13, 1905. Serial No. 282,584.

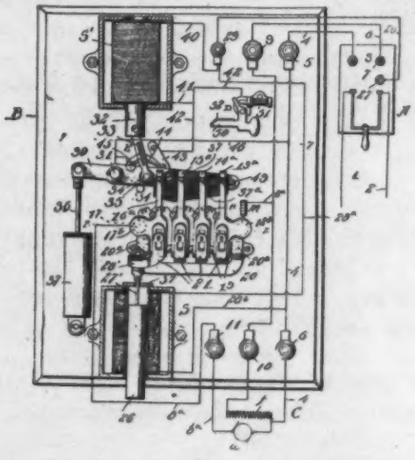
1. In a switch or circuit controller, in combination, blade supporting arms, a blade pivoted thereto, contact arms with



which the free end of said blade co-operates, a block to which said contact arms are attached, a terminal block separate from the block to which the said contact arms are secured and provided with a finger extended between the said blade-contact arms to make contact therewith, and means to detachably secure said finger to the blade-contact arms, substantially as described.

Automatic Starter for Electric Motors. 860,104. William C. O'Brien, Baltimore, Md., assignor to Monitor Manufacturing Company, Baltimore, Md., a corporation of Maryland. Filed April 19, 1905. Serial No. 256,423.

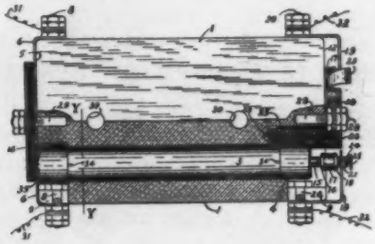
1. In an automatic starter for electric motors, the combination with the motor circuits, including a starting resistance having contact pieces, of a series of independently mov-



able fingers, an interposing device normally preventing the engagement of said fingers with the contact pieces, a rock shaft having arms thereon, springs interposed between said arms and the fingers, a solenoid having its core operatively connected to the rock shaft, a second solenoid having its core connected to the interposing device, and means for reducing the current in said second solenoid after the interposing device has been moved to release said fingers.

Substation Protector. 860,016. Frank B. Cook, Chicago, Ill. Filed May 7, 1906. Serial No. 315,618.

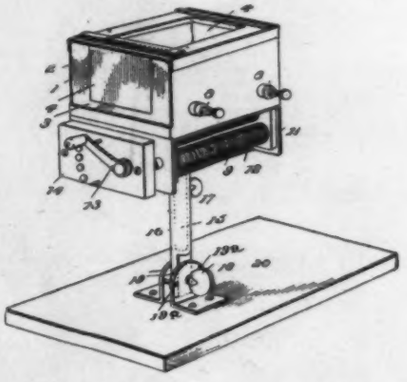
1. In a protector of the character described, the combination of a block of insulating material, inclosed fuses contained within the said block, thermal protectors connected in



circuit with the respective fuses, lightning arresters inserted into the said block and connected in branches of the respective fuse and thermal protector circuits, and suitable connection terminals for the said apparatus.

Electric Furnace. 860,587. Ross C. Unger, Cleveland, Ohio. Filed July 25, 1906. Serial No. 327,686.

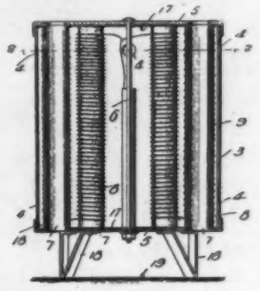
1. An electric furnace comprising a casting, refactory



linings therefor, granular resistance material located on the bottom of the furnace, and a slab of refractory material for retaining the resistance material in place.

Electric Heater. 860,179. Edward H. Abbott, Los Angeles, Cal. Filed December 19, 1905. Serial No. 292,472.

1. An electric heater composed of a hollow metal drum, the inner faces of the ends of said drum being lined with a heat resisting material, and having a plurality of air inlets at

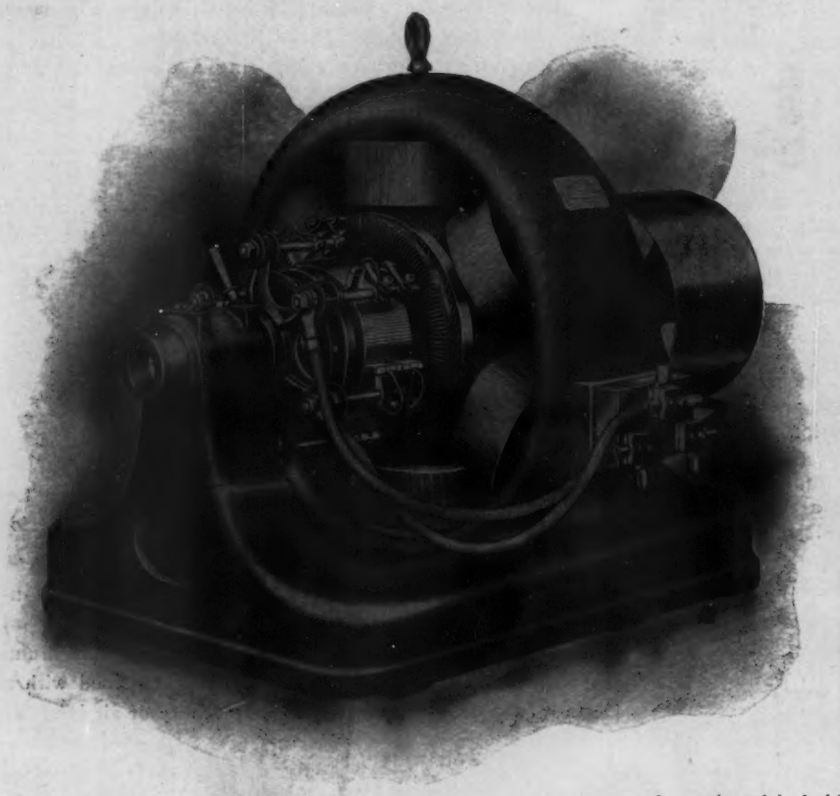


the bottom thereof and a plurality of heat outlets at the top thereof; a plurality of metal tubes covered with a heat resisting and insulating material extending from one end of the drum to the other and opening through the ends, each of said tubes being wound with a resistance coil, said coils being connected together in series; and a switch interposed in the circuit.

INDUSTRIAL

BELTED DIRECT-CURRENT GENERATORS.

It is often advisable to make use of slow-speed engines to drive belted generators of standard moderate speed design. In many cases there is a substantial saving thereby in first cost of generator. This, when combined with high efficiency of the slow-speed engine, is especially attractive to the purchaser when the cost is compared with the relatively high first cost of direct-connected generating units. It is well understood by users of electrical apparatus that greater efficiency of material is obtained by driving a generator at a



compaartively high speed. The decreased amount of copper in the field windings and the small amount of iron in the magnetic circuit, together with the smaller allowable diameter of armature which may be obtained by increasing the speed, result in a machine much smaller in size and lighter in weight, and consequently of less cost to the manufacturer.

In power stations it is sometimes convenient to operate several units from the same engine or from the same line shafting through the medium of friction clutches. This can be readily done with belt-driven generators where it would not be possible to accomplish the same purpose with direct-connected units without sub-dividing the engine equipment beyond economical limits.

Moderate speed generators for lighting are especally valuable where they may be belted to the same engine that supplies power for other purposes.

The many and various uses to which generators of this class are applied, demand that manufacturers of electrical apparatus shall be in a position to furnish standard belted machines at standard voltages in practically any capacity up to 400 kilowatts. When a unit of larger capacity is desired, it is usually found more economical to reduce the speed and connect directly to a high-efficiency slow-speed engine, in consideration both of the smaller floor space involved and of the initial cost and convenience of operation.

The Fort Wayne Electric Works manufactures belt-driven direct-current generators of standard dssign in capacities from three-quarters to 400 kilowatts and wound for the three standard voltages—125, 250 and 550 volts.

The medium sizes, ranging from 20 to 90 Kw. are built in Type L. construction, as described in this bulletin. The smaller sizes, known as Type ML and the larger sizes as type MPL, are described in other bulletins.

Type LF machines have the base, field frame with pole pieces, pulley and pedestal, and part of the commutator-end pedestal cast in one piece. The upper part of the commutator-end pedestal is a separate casting. With this exception the entire iron portion of the frame is a single casting.

Type LF generators are all two-bearing machines and are mounted on cast iron bed plates with belt-tightening devices. The commutator-end pedestal being a separate casting makes it possible to remove the armature without disturbing any other part of the machine. The separate part of the pedestal is held in accurate alignment with the base by a cap screw from beneath the pedestal. The brush mechanism of Type LF generators is mounted on the pedestal as shown in the illustration.

ELECTRIC POWER PLANTS RESPONSIBLE.

The Appellate Division of the New York Courts has decided that the responsibility for fires resulting from defective wiring and insulation rests with the electric power companies. This decision was reached after a seven years' contest, first begun in a suit brought by the German-American Insurance Company against the New York Edison Company, as being responsible for the burning of buildings improperly insulated. Judgment was given against the defendant, which later brought counter-suit against the insurance companies, but lost.

ELECTRIFICATION OF THE NEW YORK, NEW HAVEN AND HARTFORD RAILWAY.

The New York, New Haven & Hartford Railroad Company began lately to run regular electric trains between New York City and New Rochelle, N. Y., and this action will mark the inauguration of a new era in the development of American railways.

The management of the railroad decided some years ago to investigate electric traction with a view of substituting the new power for the steam locomotive. These investigations were carried on in a very exhaustive manner until finally, about a year ago, the railroad decided to install the alternating current single phase electric railway system, and a contract was made with the Westinghouse Electric & Mfg. Company for the construction of thirty-five locomotives of this type. The local company was also given the order for the power house equipment, consisting of Westinghouse steam turbines, turbo-generators, switchboard appliances, etc., and Westinghouse, Church, Kerr & Company, engineers, were given full charge of installing the entire system. The new departure in main line railroad operation is, therefore, completely furnished by Pittsburg products of engineering and inventive skill.

The work was pushed with the utmost vigor and the East Pittsburg shops turned out the first locomotive last December. The power house was completed about the same time and the installation of the machinery began at once, while, in the meantime, the construction of the overhead work had also been started. The last two locomotives were shipped from East Pittsburg some days ago. Preliminary runs, tests and trial trips have been made on the new line for months under the supervision of railroad experts and electricians. These were watched with the utmost interest by the entire railroad world, and all proved very successful. The railroad company, being satisfied with the result of these trials, has now decided to throw the electric road open to the public, and the first train pulled out of the Grand Central Depot at New York on the morning of July 21st. Until the 1st of August, trains will go only as far as New Rochelle; beginning August 1st, the schedule will be extended to Portchester, and by September 1st, the company expects to be running electric trains between New York and Stamford, Conn. The service will begin with thirty-five 1000 horse power locomotives, each capable of pulling a train of ten coaches at an average speed of 75 miles an hour.

The inauguration of the single phase system on one of America's foremost main line railroads, marks an epoch in the development of the railroad business in this country. When it was first brought out, many of the country's famous electricians looked upon it very dubiously; but since then its many advantages have been so thoroughly demonstrated that, at a recent meeting of the American Institute of Electrical Engineers, it was pronounced the most practically commercial electric railway system known today, and that its principles presented, for the first time, the solution for the transformation of steam roads into electric railways.

MILWAUKEE NORTHERN RAILWAY TO BE PLACED IN OPERATION BY EARLY FALL.

The line of the Milwaukee Northern Railway between Milwaukee and Port Washington will probably be ready for operation early in September and all work is being pushed as rapidly as possible to that end. From a point a little over two miles north of Milwaukee to the town of Crafton, a short distance from Port Washington, tracks are laid. All grading between these points has been practically completed. The force of men engaged in this work will shortly be put on the work between Port Washington and Sheboygan, where another gang of workmen has been clearing the right of way. The Allis-Chambers Gas Engines are being erected in the main power house at Port Washington.

The complete power equipment was built by Allis-Chambers Company, Milwaukee. Three phase alternating current will be generated in the power house at 405 volts by three direct connected Allis-Chambers alternators, each of 1000 kilowatts normal capacity, driven at 107 revolutions per minute by Allis-Chambers twin tandem gas engines, each with a rated capacity of 1500 horse power. This equipment, when in operation, will constitute the largest installation in America of gas engine-driven electric generating units used for traction purposes.

FACTS ABOUT BOILERS.

Nothing in or about a steam plant cuts down the dividends, runs up the operating expense, and causes trouble without a single benefit, more than boiler scale. It is a universal foe to those who operate, or are in any way connected with steam plants. The principle scale-forming substances in feed-water are carbonate of lime, sulphate of lime or gypsum and magnesia. These are soluble in cold water and in water of moderately high temperature, but become insoluble at a temperature of 303 degrees, which corresponds to an absolute steam pressure of 70 pounds.

Scale-forming substances are precipitated by heating and evaporating the water. Part of the precipitation is deposited as mud, and part settles on the hot plates, tubes, crown sheets, side sheets, or any place in the boiler where these mineral substances may get in contact with the iron, and form scale. Scale is very objectionable in a boiler, because it seriously detracts from the heat transmitting power of the metal that is in the boiler.

In boilers that have a 1/16 inch scale, the efficiency is decreased 30 per cent, thus requiring about 15 per cent more fuel to get the required evaporation. Scale keeps the water from coming in contact with the plates, causing them to become overheated, which greatly shortens the life of a boiler.

The question that naturally confronts the steam user is, how can this scale be removed and its formation prevented at a minimum cost, without injury to the boiler or loss of time?

A compound that will remove scale that is already formed, must go to the root of the evil. It must act on the iron in such a manner as to remove the scale, and once removed, to keep it so. This is the secret of the Magic Boiler Compound now being offered for sale by the H. W. Johns-Manville Co.

Its action is natural—neither mechanical nor chemical. When introduced into the boiler it seeks the iron, and, working its way between the scale and iron, causes the scale to loosen and fall off, and presents a surface to which no further sediment will adhere.

Magic Boiler Compound is adapted to every climate and locality and no analysis of water is required in order to secure the best results. The H. W. Johns-Manville Co. is issuing an interesting folder entitled "How to Clean a Boiler," which gives some very valuable information on this subject.

NEWS NOTES

TRANSPORTATION.

Chico, Cal.—The Northern Electric Company has laid its first rails on the Chico-Hamilton City section of its line.

San Francisco.—The Monterey and Pacific Grove Railroad Company has changed its principal place of business from Monterey to San Francisco.

San Mateo, Cal.—The application of P. Thorsen and J. Johns for electric street railway franchises covering a number of the streets of this place has been refused.

Marysville, Cal.—Nine more miles of track will complete the Northern Electric Railway between Marysville and Sacramento, and the gap is expected to be closed this week. It is claimed that by the middle of August electric cars will be running from Chico to Sacramento.

San Rafael, Cal.—It is reported that the North Shore Company has in prospect a plan to reduce the time on its line between this place and San Francisco very materially. The plan will, it is claimed, put it on an equality with the proposed line of the Napa & Lakeport Railroad Company.

Richmond, Cal.—The report is current that the East Shore & Suburban Railway Company will soon extend its line south on Twenty-third street, crossing the Southern Pacific north of Stege and erecting a long pier, as preliminary to the establishing of a forty-minute ferry system between Richmond and San Francisco.

Los Angeles, Cal.—It is given out that the H. E. Huntington interests have definitely planned to have an electric line completed between Los Angeles and San Diego within three years and it is understood that it is expected to have the work done before that time. The distance yet to be covered in this move amounts to a little less than half of the total distance between the two cities. The line will parallel the line of the Santa Fe.

San Francisco.—The State Board of Railway Commissioners is reported to be considering the advisability of appointing an agent to investigate the conduct of the various interurban electric railways throughout the State with a view of preparing bills to be submitted to the legislature giving the commission jurisdiction over such roads. In the opinion of the commissioners, the electric railroads are similar to the steam roads and should properly be under their supervision.

St. Helena, Cal.—The extension of the Vallejo, Benicia and Napa Valley Electric Railroad from Napa to St. Helena is rapidly nearing completion. The grading has been finished for the entire distance and all bridges and culverts are in place. The rails and trolley poles are laid almost as far as Yountville, one-half of the distance to St. Helena. The directors of the road have decided not to extend the road to Calistoga until the property owners become more liberal in their terms for a right of way.

Auburn, Cal.—Representatives of the Sacramento and Lake Tahoe Railway Company have filed a dozen notices of location with the County Recorder. These include water rights and dam and reservoir sites on the middle fork of the American River for storage of water for generating electric power. The company has secured all of its rights of way in this and El Dorado counties. The line will cross the American River near Folsom, and, running east of Loomis, will use the old railroad grade at the Owen King place. Then, continuing up through Long Valley, it will enter Auburn near the bridge across the cut near the Dyson place.

Oakland, Cal.—It is again reported that the Southern Pacific Railroad Company is preparing to build an electric line in this city to compete with the Key Route system. The company has been making heavy purchases of property in the neighborhood of Twenty-second and Broadway, and has, it is asserted, already secured enough to give it a private right of way from Franklin street to San Pablo avenue. Franchises will be asked from Fourteenth to Twenty-first on Franklin and from San Pablo avenue to the vicinity of Sixteenth-street station on either Twentieth or Twenty-first streets. It is understood, however, that before this plan is carried out the company will build a large power plant somewhere in the Sierras which will supply current not only for the local lines in Alameda county but for the carrying of the company's overland trains over the mountains from Reno to Sacramento.

WATERWORKS.

Mountain View, Cal.—At the last meeting of the Board of Trustees, the fire, light and water committee recommended that a 1,500-gallon surface tank be purchased for use at the water works.

Oakland, Cal.—The City Council has adopted the recommendation of the Board of Public Works and has made the necessary appropriation for putting in a salt water pump at Lake Merritt.

POWER AND LIGHT.

Tropico, Cal.—A meeting has been held here for the purpose of promoting a movement to secure gas for light and fuel for this section of the country.

Fresno.—The petition of the Chinese Electric Light Company for a franchise was not considered this week at the special meeting of the Board of Trustees, called for that purpose, owing to a request from the city attorney that the matter be delayed till he could be present.

FINANCIAL.

San Francisco.—The Los Alamitos Oil & Development Company has levied an assessment of 5 cents per share on the capital stock of the company, delinquent September 3rd.

San Francisco.—The Palmer Oil Company has called a meeting of the stockholders of the company to take action on a proposition of creating a bonded indebtedness of $1,000,000.

San Francisco.—A monthly dividend of 5 cents per share has been declared on the capital stock of the Northern California Power Company, payable on and after July 25th.

San Jose.—After a consultation with Assessor Spitzer, the Board of Supervisors of Santa Clara County, sitting as a Board of Equalization, decided on July 25th not to raise the assessment of the electric roads in the county this year. The sentiment was in favor of raising the assessment next year.

New York.—It now appears that in spite of the denials last week, the meeting of the stockholders of the United Railways Investment Company did take place. As expected, the stockholders approved of the proposed note issue. Treasurer Guiness says that of these $1,300,000 have been sold and that the balance will not be sold at present. The proceeds of the notes sold will be used for the acquisition of outstanding securities of the United Railroads and of 100 additional cars.

San Francisco.—According to the reports in circulation this week, the matter of the sale of the California Street Cable Railroad has not yet been settled. It is said the present offer of the United Railroads for the property is $160 per share for the 10,000 shares of the company's stock. This amount is to be paid partly in cash, partly in United Railroads 5 per cent bonds and partly in the new 7 per cent preferred stock. This is said to be the second offer made by the United Railroads since the fire, the first offer being $150 per share. It is believed that the postponement of the annual meeting of the company was due to the impending sale of the property to the United Railroads. It is rumored that Henry Meyer, of Borel & Co. will succeed Mr. Stetson as president of the company. Mr. Meyer is a director of both the California Street and the United Railroads companies.

San Francisco.—The United Railroads has authorized the sale of 50,000 additional shares of stock at par value of $100 per share in order to extend, rehabilitate and improve the service. The new issue makes the total of shares 450,000 at a par value of $45,000,000. The increase was voted practically unanimously at a meeting of the stockholders on June 22nd, at which Messrs. Calhoun, Willcutt, Mullally, A. C. Kains, J. H. Meyer, W. M. Abbot and George E. Starr were present, representing a total of 399,997 out of 400,000 issue is of preferred stock, being preferred over even the former issue of preferred stock. It will yield an income of 7 per cent per annum. It is provided that these latest shares may be redeemed by the company in whole or in part, six months after their issue at $110 per share. President Calhoun says that the money realized from the sale of the stock will provide additional money for the general plans for improvement of the company's service. He says that the issue is a part of the plans formulated before he left the East.

TELEPHONES.

Portland, Ore.—The Home Independent Tel. Co., already doing business in Union and Wallowa counties, has asked for a 25-year franchise.

Victoria, B. C.—The site for the wireless station on Shotbolt's Hill has been purchased, and the erection of the building and equipment for the station will be commenced soon.

Boise, Idaho.—C. J. Sinsel, manager of the Independent Tel. Co., says the proposed line to Homedale will follow the line of the S. F., I. & M. railroad and that work will soon begin.

Grangeville, Idaho.—The Nezperce Co-operative Tel. Co. has closed a deal with the Tolo Tel. Co., a farmers' line, by which it will connect at Grangeville with the Nezperce line.

Chilliwack, B. C.—The farmers of Chilliwack have organized a company with a capital of $15,000 and plan to build a system covering the entire district with a local exchange at this place.

Troy, Idaho.—The new line built by the farmers of Burnt Ridge has been connected with the Troy exchange of the Interstate system. It is stated that work on the proposed line from Troy to Avon will begin soon.

Tacoma.—The Island Empire Tel. & Tel. Co. has petitioned the County Commissioners to be allowed to run lines along county roads. The company is connecting the islands of the Sound with Tacoma, a portion of the cable system being already laid.

Grangeville, Idaho.—S. C. Daniels, owner of the telephone line from here to Buffalo Hump, is constructing a line from the Hump to Orogrande, where it will connect with a wire to Elk City, and from there to Stites. The Grangeville-Hump line is being repaired and improved.

Hood River, Ore.—The Home Tel. Co. has been organized with a capital of $40,000 to provide a system for long distance connections over the N. W. Tel. & Tel. Co.'s lines. The system will be available in three months from the time active work is started, which will be about Aug. 1st.

Okanogan, Wash.—Kora F. Briggs of Chesaw, is trying to interest people of this place in the Independent telephone system. He has installed a line from Chesaw to the railroad station at Myneaster and expects to establist a central office at Chesaw, with phones in business houses, farms and mines.

Moscow, Idaho.—The Interstate Tel. Co. of this city has been merged with the Spokane Co. of the same name. The old stock has been called in and new issued. There is also a reincorporation and a reorganization. The new deal will arrange for Spokane long distance connection with either the Pacific States or Home people.

TRANSMISSION.

Cottonwood, Cal.—James Barry and Charles Tozer are to organize a new electric power company to build a plant at Beegum, on Beegum Creek, where they have filed claims on 10,000 inches of water.

San Francisco.—The San Francisco Gas & Electric Company has applied for a permit to re-roof its power house building in the block bounded by Twenty-second, Twenty-third, Georgia and Louisiana Streets. The work is to cost $60,000.

Palo Alto, Cal.—The city trustees have granted the California Gas & Electric Corporation a permit to erect a line of poles and string wires on Hawthorne Street from its main line on Middlefield road to the interurban street railway power house at High Street.

Carson, Nev.—The poles for the Truckee River electric line to Minden and Gardnerville have been received and work on the framing and placing has been started. Everything in the way of material for the construction of the line is now on hand and it is said that the work will be rushed.

San Jose.—J. A. Belloli has asked the county Board of Supervisors for a franchise to erect poles and string wires along a number of county roads of Santa Clara County. He announces that his plans are to buy power at wholesale from the United Gas & Electric Company and to retail it for light and power purposes to small and more of less isolated users.

Willows, Cal.—The directors of the Snow Mountain Electric Company report that the first issue of the company's stock has all been sold and that active work will be commenced soon. The erection of a long flume which will require 1,000,000 feet of lumber will be started as soon as the mill begins to saw the lumber. Work is to be pushed to completion, and inside of a year the company is expected to be furnishing power in Glenn and Colusa Counties.

Lodi, Cal.—The inability of the American River Electric Company to generate sufficient power is seriously handicapping the Central California Traction Company. The floods during the spring carried away a portion of the power company's works, and as a result this company is not able to fill the needs of the traction company. It is said that in the course of about two weeks the American River Power Company will have its auxiliary plant in Banner Island near Stockton in operation and it will not then depend entirely on the hydro-electric plant.

San Francisco.—Julius Kruttschnitt, vice-president of the Southern Pacific and director of maintenance of way of the entire Harriman system of railroads, says in regard to the electric plans of the company in Oakland: "We are soon to build up on the Oakland estuary on a block of land we have bought for the purpose, one of the finest, most modern and up-to-date electric power plants in the United States. It will occupy the whole block, which is about 400 feet square. It will be quite a showy building and the cost will be high, as we shall have big coal bunkers there and mechanical stoking devices for supplying the furnaces with fuel. The plans for this electric power house have been finished and Electrical Engineer Babcock has started East to submit them to Mr. Harriman. They are the result of Mr. Babcock's study and adaptation of a number of notable plants in various parts of the country and they embody all of the latest ideas."

POWER AND LIGHT.

Wenatchee, Wash.—The Wenatchee Electric Co. has asked the council for a franchise for a gas plant.

Anaconda, Mont.—The Williams Heating Co. will at once begin the construction of a heating plant to supply the business and residence districts.

St. Johns, Ore.—The St. Johns Gas Light & Heating Co. has asked for a 25-year franchise, the company to construct a $30,000 plant if the same is granted.

Spokane, Wash.—The Big Bend Light & Power Co. has been incorporated with a capitalization of $300,000 to furnish light and power to towns in the Big Bend country.

Cottage Grove, Ore.—The electric light plant of the Willamette Valley Co. has been destroyed by fire. Loss, $20,000; insurance, $4,800. The plant will be rebuilt at once.

Montesano, Wash.—County Commissioners have granted the Elma Light & Power Co. a franchise to erect poles and string wires along county roads for transmission of electrical power.

Swanson Bay, B. C.—The Canadian Pacific Sulphite Paper Co. has awarded the contract for a power dam, pipe line and electric lighting plant to Elliot & McCallum of Vancouver.

Fairbanks, Alaska.—The Tanana Electric Co. has mortgaged its plant to the Scandinavian American Bank of Seattle for $100,000, the money to be used in making extensions to the system.

Seattle.—The Tolt Power & Transportation Co. has asked permission of the county court to condemn 146½ acres in township 26, range 8, for the purpose of utilizing the waters of Tolt River for generating electricity.

ILLUMINATION.

Colusa, Cal.—Charles H. Glenn and others have been granted a franchise for an electric transmission system for lighting and power purposes in this city.

Ukiah, Cal.—The Board of Trustees will receive sealed bids up to August 5th for furnishing a switchboard to be used in a sub-station carrying a three-phase current of 100 amperes at 2300 volts.

San Francisco.—Sealed proposals have been received by the Constructing Quartermaster at Fort Mason for furnishing material and labor and installing fixtures and watt meters in the Post Exchange building at the general hospital in the Presidio of San Francisco.

San Rafael.—Wallace Foster of the Pacific Gas & Electric Company, has solicitors among the people of San Anselmo, Ross, Corte Madera, and in southern Marin County for the purpose of ascertaining if the company would be justified in putting in a gas plant in that section of the county.

San Bernardino.—C. M. Grow, local manager of the San Bernardino Gas & Electric Company, states that over $17,000 is to be expended here in improving the plant of the company. Contracts calling for $9,700 have been let, and another for $8,000 will be awarded in a few days. The capacity of the plant will be enlarged.

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